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Strasburger's published views. The addition of subject-matter more suited to a text-book is also to be criticised, since it makes the work too long for a manual, without being full enough for a text. These liberties seem hardly justified by the translator's remark in the preface that "the curious in such matters can doubtless disinter them (the translator's additions) by a comparison of the first English edition (in which all such additions were in square brackets), and of the German third edition, with the present issue."

While the fact that the translation has reached a fifth edition indicates that there is a demand for Professor Strasburger's *Practicum* in English, we believe it would have been better to have presented simply a translation, with an appendix indicating English and American types which could be substituted for the German forms when the latter are inaccessible.—CHARLES J. CHAMBERLAIN.

Engler and Drude's "Vegetation der Erde."

THREE MORE VOLUMES of this most important series have appeared lately, making five volumes already issued.[4] The recent treatises are on the Caucasus region by Radde, on the Illyrian countries by Beck, and on the North German heath by Graebner. Radde's work[5] alone will be considered here, but early attention to the others may be expected. In the historical account one is surprised to see the immense number of botanists who have worked in the Caucasian region of Europe and Asia; one of the first was Tournefort in 1717, another was the Russian botanist Güllenstädt in 1787. More recently Ledebour, C. A. Meyer, Ruprecht, Trautvetter, Albow, Krassnow, and a host of others have made this region well known botanically. Radde himself has written a large number of botanical papers relating to Caucasia, having worked there since 1854.

The first chapter deals with the steppes, which are found in their perfection north of the Caucasus mountains. As elsewhere, the steppes of Caucasia are of very recent geological origin; the famous "black earth" is the characteristic soil. A large portion of the steppe region has been artificially deforested. As in America, grassy steppes pass gradually into Artemisia half-deserts, or into thickets like our chaparral (Paliurus maqui). Along the streams poplars and willows occur as on our prairies. Sand dunes and halophytic areas are present in some places, the latter especially near the Caspian sea. Where artemisias now occur, halophytes were once present; before them was the sea, and still further back fresh water lakes. Thus the life history of the Caspian region closely resembles that of our salt lake districts. On the mountain slopes the steppes pass rather rapidly into forests. The steppes are best developed near the Black sea, while the halophytes and artemisias are more abundant toward the Caspian sea. Smaller and similar steppes are found south of the Caucasus, paths of migration occurring along the Caspian shore.

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[4] BOT. GAZ. **26**: 356. 1898.

[5] RADDE, DR. GUSTAV, Grundzüge der Pflanzenverbreitung in den Kaukasusländern von der unteren Wolga über den Manytsch-Scheider bis zur Scheitelfläche Hocharmeniens. 8vo, pp. xii + 500, with 13 text figures, 7 heliogravures, and 3 maps. Leipzig: W. Engelmann. 1899.

The second and third chapters have to do with the luxuriant forests of Colchis near the shore of the Black sea, south of the Caucasus, and the similar forests of Talysch near the Caspian. These forests enjoy a mild maritime climate and are largely of the Mediterranean evergreen type (Schimper's sclerophyll forests), in which the cypress, laurel, olive, arbutus, ilex, etc., are abundant, as well as a few deciduous trees ; conifers are scarce. Some species now endemic in Colchis were widespread before the ice age, so that Wettstein believes that this region was a prominent place of refuge in the Pleistocene. Conditions are similar in Talysch, except that conifers are wholly absent. Other Caucasian forests are described in the fourth chapter. Western Caucasia has more forests than the eastern part of the district, a consequence of climatic differences. Ascending the mountains, one sees the Paliurus maqui pass into true forests of deciduous trees and conifers like those of Europe. Higher up are great Rhododendron thickets.

Xerophytic rock plants are treated in the fifth chapter. The characteristic forms are Persian, such as Astragalus and Acantholimon, and decrease northwestward as the climate becomes moister. Lists of calcicoles and silicicoles are given, but Radde tends to minify their importance. The next chapter is concerned with the mountain floras, which reach a high development in Caucasia. The snow and timber lines are much lower in the west Caucasus region than farther east because of the high precipitation, but there is no difference between the north and south slopes. The subalpine regions have a dense vegetation, in which Rhododendron takes an important place. In the alpine regions plants are scattered, and at least two species complete their life cycle a thousand feet above the snow line. Sphagnum bogs are confined to the alpine regions. The last two chapters contain phenological data and a floristic subdivision of the Caucasian region.— H. C. COWLES.

NOTES FOR STUDENTS.

K. SHIBATA has made an extended study of the course of growth and of the changes which occur in the reserve food during the development of the shoots of the bamboo.[6] These observations supply many details in the knowledge of the life history of *Phyllostachys mitis* and the other species used for comparative study.—C. R. B.

A VERY READABLE account of statistical methods as applied in biology is

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[6] Jour. Coll. Sci. Imp. Univ. Tōkyō **13** : 427–502. *pls. 22–24.* 1900.